Simpson

INSTRUMENTS THAT STAY ACCURATE

SPERRO LABORATORIES, INC.
TECHNICAL REFERENCE LIBRARY
DOCUMENT CONTROL ADMINISTRATOR

260 Add-A-Tester Adapter

OPERATOR'S MANUAL

AUDIO WATTMETER MODEL 654

SIMPSON ELECTRIC COMPANY
5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121
In Canada, Bach-Simpson, Ltd., London, Ontario

New SIMPSON 260 "Add-A-Tester" Line

TRANSISTOR TESTER, Model 650 . . . . . $26.95
Beta Ranges: 0-10, 0-50, 0-250, (F.S.)
Beta Accuracy: ±3%, with 260 ±5% nominal
Ico Range: 0-100 ua
Ico Accuracy: ±1%, with 260 ±3% (F.S.)

DC VTVM, Model 651 . . . . . $32.95
Voltage Ranges: 0-.5/1.0/2.5/5.0/10/25/50/100/250/500
Accuracy: ±1%, with 260 ±3% (F.S.)
Input Impedance: greater than 10 megs all ranges

TEMPERATURE TESTER, Model 652 . . . $38.95
Temperature Ranges: −50°F to +100°F, +100°F to +250°F
Accuracy: with 260 ±2° (nominal)
Three lead positions provided
Sensing Element: thermistor

AC AMMETER, Model 653 . . . . . $18.95
Ranges: 0-0.25/1/2.5/12.5/25 amps
Accuracy: ±1%, with 260 ±3% nominal
Frequency Range: 50 cycles to 3000 cycles

AUDIO WATTMETER, Model 654 . . . . . $18.95
Load Ranges: 4,8,16,600 ohms
Wattage: Continuous 25 watts (8,600 ohms)
50 watts (4,16 ohms)
Intermittent 50 watts (8,600 ohms)
100 watts (4,16 ohms)
Accuracy: ±5%, with 260 ±10% nominal
Direct reading scale from 17 microwatts to 100 watts

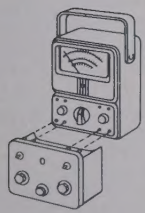
MICROVOLT ATTENUATOR, Model 655 . $18.95
Ranges: 2.5 microvolts to 250,000 microvolts continuously variable in decade steps
Frequency: DC to 20 KC
Accuracy: ±1db

BATTERY TESTER, Model 656 . . . . . $19.95
Checks all radio and hearing aid batteries up to 90 volts at the manufacturer's recommended load, or any external load.

Note: All Simpson 260 Adapters provide for normal 260 usage without disconnecting the adapter.

OPERATOR'S MANUAL

AUDIO WATTMETER MODEL 654



Just plug it in

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44, Illinois, ES 9-1121

In Canada, Bach-Simpson, Ltd., London, Ontario

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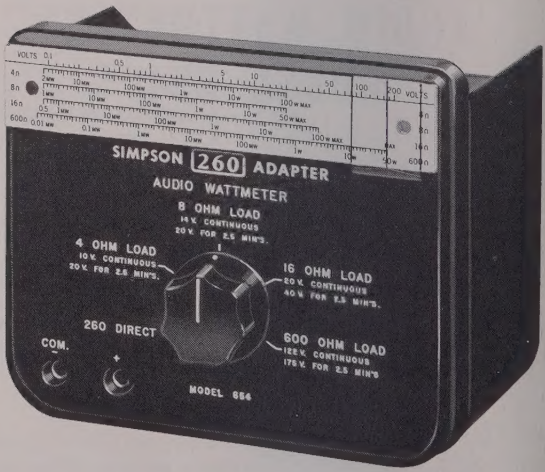


FIGURE 1 – SIMPSON AUDIO WATTMETER MODEL 654

OPERATOR'S MANUAL

SIMPSON AUDIO WATTMETER MODEL 654

SECTION I

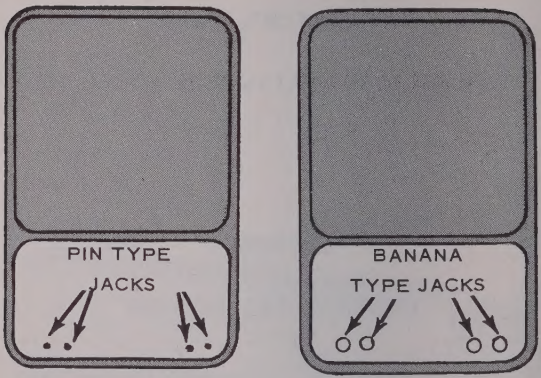
GENERAL DESCRIPTION

INTRODUCTION

The Simpson Audio Wattmeter Model 654 is a compact, reliable instrument designed to assist in installation or servicing of telephone, high-fidelity, and public address systems. When it is used in conjunction with a Simpson **260*** or **270** VOM, it provides a known load for the circuit under test and measures the output wattage across the load from DC to 20 kilocycles per second.

The Simpson VOM-plus-adapter concept is completely unique in approach and versatility. Each of the adapter models, of which the Audio Wattmeter is but one example, provides specific measurement and testing capabilities at a fraction of the cost normally required for separate testers.

*Trade Mark Registered U.S. Patent Office



(a) 260, Series II (b) 260, Series III

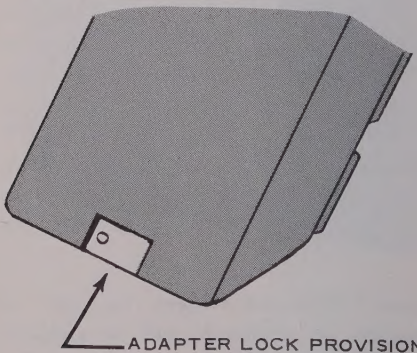


FIGURE 2 – 260* IDENTIFICATION

*Trade Mark Registered U.S. Patent Office

ACCESSORIES FURNISHED

Each instrument is furnished with an Operator's Manual and four extra pin-type plugs. The four pin-type plugs are used only when the Model 654 is to be used with a 260 Series II (see figure 2 for 260 Series II and Series III identification).

Test leads are not furnished with the Model 654. If you do not have a pair of test leads with banana plugs, obtain them for use with the instrument; the Simpson Part Number for a pair of leads is 10–837500.

Specifications

Loads available: 4, 8, 16, and 600 ohms

Load accuracy: ±5%

Wattage ranges: (with an ambient temperature of 77° F.)

4 ohm load – 50 watts continuous,
100 watts for 2.5 minutes
8 ohm load – 25 watts continuous,
50 watts for 2.5 minutes
16 ohm load – 50 watts continuous,
100 watts for 2.5 minutes
600 ohm load – 25 watts continuous,
50 watts for 2.5 minutes

Wattage accuracy:

Adapter only: (Load Accuracy) ±5%
Adapter with **260**: ±10% F.S. (nominal)
Adapter with **270**: ±7% F.S. (nominal)

Frequency Response: essentually flat from DC to 20 Kc.

Power Input: None required.

Size: 5-5/16 x 4-3/8 x 3-7/16 inches.

Weight: 1¼ lbs.

MODIFICATION KITS

Adapter Case Kit 401 for 260 Series III and 270.

Use of this kit is optional. The kit converts the **260** Series III or the **270** VOM produced prior to June 1, 1959. It consists of a modified case which permits latching the Model 654 securely to the underside of the Multimeter.

Adapter Case Kit 402 for 260 Series II.

Use of this kit is optional for this adapter. It includes a modified case which permits latching the Model 654 securely to the underside of the Multimeter, and parts necessary to provide a 50 μA D.C. current range for the **260** Series II. The 50 μA. D.C. range is required for other adapter models.

CONTROLS AND CONNECTORS

LOAD SELECTOR

This is a five-position rotary switch. One position, marked 260 DIRECT, connects the input jacks through to the VOM without any load. In each of the other four positions, a resistive load and the **260/270** are both connected across the input terminal jacks.

To use the Model 654 Audio Wattmeter, this switch is set for the load resistance which matches output impedance in the audio source being measured. The values are 4, 8, 16, and 600 ohms.

To use the VOM, this switch is set at 260 DIRECT.

INPUT JACKS

There are two input jacks located at the lower left on the front panel. They are marked + and COM −, and are connected directly to the similarly marked jacks on the **260/270.**

SLIDE RULE

The slide rule at the top of the front panel is used to convert voltage, indicated across any selected load resistance, into wattage. When the hairline is placed over the voltage (on the VOLTS scale), it shows wattage for each of the four resistive loads.

SECTION II

OPERATING INSTRUCTIONS

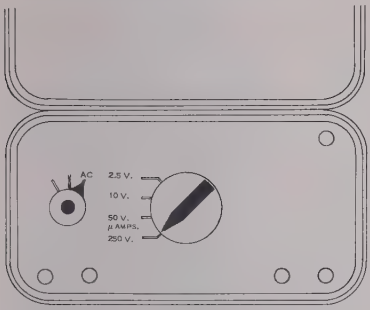
CAUTION

Many audio amplifiers can be damaged if they are operated without a load in the output circuit. Do not set the Model 654 Selector Switch at its 260 DIRECT position while the instrument is connected to an audio amplifier output.

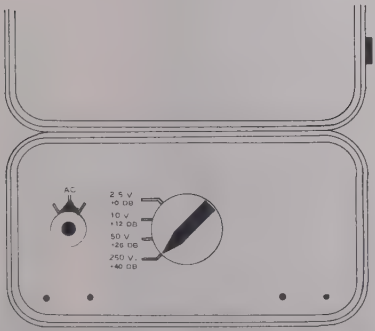
1. Initial Adjustments

a. Model 260/270 control settings.

1. With the Model 654 disconnected, check the meter pointer position for zero indication with the VOM in its operating position. If the pointer is



(a) 260 Series III Control Positions



(b) 260 Series II Control Positions

FIGURE 3 – 260 CONTROL SETTINGS FOR USE WITH MODEL 654

off zero, adjust the bakelite screw just under the meter. Refer to the VOM Operator's Manual for this adjustment.

2. Set the **260/270** for A.C. or D.C. as required.

3. Set the **260/270** range switch for the desired range of voltage. If the voltage range is not known, set the range switch at the highest position first; a lower range may be set after the first reading if the voltage is within the limits of a lower range.

b. Connecting the Model 654 to the 260/270.

1. Insert the top four plugs of the Model 654 into the lower four jacks on the front panel of the **260/270.**

2. Position the locking latch underneath the instrument to secure the two units together.

CAUTION

If your 260/270 case does not have the locking provision, avoid applying excessive pressure to the top of the Adapter when it is connected to the VOM, and used in the Adjust-A-Vue position. A modification kit which includes a new case with an adapter lock provision is recommended for optimum rigidity (see page 4).

c. Model 654 Control Settings.

1. Set the Selector Switch of the Model 654 to the position which indicates the load resistance desired.

2. Measuring Audio Wattage.

a. De-energize the circuit which is to be tested.

b. Remove any load which may be connected to the output of the circuit to be tested (i.e., phones or speakers).

c. Connect the test leads of the Model 654 to the output connections of the circuit to be tested.

d. If the equipment to be tested has an impedance selector, set its impedance for the same value as is indicated at the Selector Switch position used on the Model 654.

e. Connect an audio signal generator, or other audio frequency source, to the input of the equipment to be tested. Set its frequency and level as recommended in the manufacturer's literature, and set the equipment controls for the output level to be measured.

f. Turn on power for the equipment being tested.

g. Record the A.C. voltage as indicated on the **260/270** meter.

h. Set the hairline of the slide rule on the Model 654 at the indicated voltage; read watts at the hairline on the scale which matches the load being used. (Example: If the load is 16 ohms, and the VOM reads 12 volts AC, the slide rule indicates 9 watts.)

3. Using the VOM Circuits While Model 654 is Attached.

Be sure the test leads are removed from any amplifier output connections. Then set the Model 654 Selector Switch at 260 DIRECT, and proceed with the standard operating instructions for the VOM, according to its Instruction Manual.

SECTION III

THEORY OF OPERATION

GENERAL

The Model 654 Audio Wattmeter consists of a known resistive load, provisions for measuring the voltage across the load, and a slide rule for easy calculation of the indicated wattage. A load resistor (in the Model 654) is substituted for the normal output load of the equipment on which measurements are to be made. The load resistors available in the Model 654 match the values of output impedance commonly used in telephone and audio equipment.

The power can be calculated using the formula

$$P = \frac{E^2}{R}$$

where P is power, E is voltage and R is resistance. Since the load resistors in the Model 654 are non-inductive (up through 20,000 cycles), impedance may be disregarded, even though Audio Wattage is essentially an AC measurement. The Model 654 provides the load; the Model 260/270 reads the indicated voltage; and the slide rule on the Model 654 calculates the wattage for the voltage-resistance combination.

CLOSER ACCURACY

If better accuracy is required it can be obtained by the following method.

1. Use a Wheatstone Bridge to measure the resistance of the load which will be used in the Model 654.

2. Use the standard operating procedures to obtain a voltage indication on the **260/270.**

3. Calculate the effective power with the formula $P = E^2/R$. The resulting accuracy will be the tolerance of the Wheatstone Bridge plus the voltage accuracy of the **260** or the **270.**

SECTION IV

MAINTENANCE

CASE REMOVAL

To remove the instrument from the case, remove the four screws located in the four corners on the back of the instrument case. All of the components are attached to the front panel.

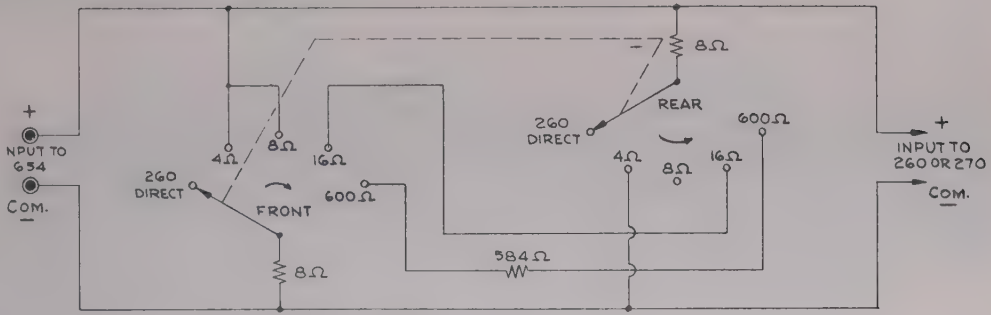
PARTS REPLACEMENT

All of the components of the Model 654 have been engineered for many years of useful life. However, there are conditions under which parts may become damaged or faulty, and require replacement. Refer to the circuit diagram in figure 4 to help identify and locate any suspected part.

In the event of any component failure, order replacement parts from Simpson Electric Company or from any Authorized Warranty Repair Station. A list of these repair stations is included, beginning on page 16.

PARTS LIST

Reference Symbol	Description	Simpson Part No.
R1	Resistor, 8 ohms, ±5%, 25 w, non-inductive	1–118090
R2	Resistor, 8 ohms, ±5%, 25 w, non-inductive	1–118090
R3	Resistor, 584 ohms, ±5%, 25 w, non-inductive	1–118089
S1	Switch, Rotary	1–118093
	Slide Rule Scale	1–118088
	Slide Rule Screw	1–118142
	Slide Rule Hairline Indicator	1–118139
	Slide Rule Spring	1–118140
	Knob, Swith, with set screw	1–115548
	Case, Adapter	10–860379



NOTE:

SWITCH SECTIONS SHOWN IN EXTREME COUNTERCLOCKWISE POSITION.

FIGURE 4 – SCHEMATIC DIAGRAM, SIMPSON AUDIO WATTMETER MODEL 654

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

*California, Los Angeles ADams 2-4201
Quality Electric Company
3700 South Broadway
States: So. California below Fresno and Arizona

*California, San Francisco GArfield 1-7185
Pacific Electrical Instrument Lab.
111 Main Street
States: No. California above Fresno and Nevada

Canada
Bach-Simpson Ltd. GLadstone 1-9490
1255 Brydges Street
P.O. Box 484
London, Ontario, Canada

*Colorado, Denver RAce 2-8670
Meter-Master Instrument Service
2379 Downing Street
States: Wyoming, Utah, Colo. and New Mexico

*Georgia, Atlanta PLaza 3-4128
Electro-Tech Equipment
690 Murphy Avenue S. W.
States: Alabama, Georgia, Florida,
No. & So. Carolina, and Tenn.

*Parts Depots

*Illinois, Chicago COlumbus 1-1330
Pacific Indicator Company
5217 W. Madison Street
States: Chicago, Wisconsin and Indiana

*Louisiana, New Orleans TWinbrook 5-5621
Industrial Instrument Works
3328 Magazine Street
States: Arkansas, Mississippi and Louisiana

*Massachusetts, Cambridge UNiversity 4-2494
Alvin C. Mancib Company
363 Walden Street
States: Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island and Maine

*Michigan, Detroit LIncoln 7-1000
Ram Meter, Inc.
1100 Hilton Road, Ferndale
States: Michigan

*Minnesota, Minneapolis KEllogg 7-5411
Instrumentation Services
917 Plymouth Avenue
States: Minnesota, North and South Dakota

*Missouri, St. Louis FOrest 7-9799
Scherrer Instruments
5449 Delmar Blvd.
States: Illinois below Peoria, Iowa, Missouri, and Kansas

*New York, Buffalo EXport 2-2726
Electrical Instrument Labs.
1487 Hertal Avenue
States: New York State except Met. N. Y.

*New York 7, New York BArclay 7-4977
Simpson Instrument Service Corp.
27 Park Place
States: Metropolitan New York and New Jersey, above Trenton

New York, Syracuse HYatt 2-1651
Syracuse Instrument Lab.
2904 South Avenue

*Ohio, Cleveland CLearwater 1-4609
Weschler Electric Company
4250 W. 130th Street
States: Ohio and Kentucky

Oregon, Portland BElmont 4-6683
The Instrument Laboratory
1316 S.E. 7th Avenue

*Pennsylvania, Philadelphia ORchard 3-5600
Sunshine Scientific Instrument
1810 Grant Avenue
States: Penn. Md. New Jersey below Trenton, Virginia, W. Virginia, Washington, D.C., Delaware

*Parts Depots

*Texas, Dallas TAylor 4-2626
Nelson Electronic Eng. Co., Inc.
6329 Gaston Avenue
States: Oklahoma and Texas

Texas, Houston CApitol 8-2835
Nelson Electronic Eng. Co., Inc.
3615 Gulf Freeway

*Washington, Seattle ATwater 3-5850
The Instrument Laboratory, Inc.
934 Elliott Avenue West
States: Oregon, Washington, Idaho and Montana

*Parts Depots

Add-A-Tester Adapter

Model 651
DC VTVM

Designed for

TRANSISTOR CIRCUITRY
and GENERAL (AGC, Power
Supplies, etc.) SERVICING.

Laboratory Type DC
Coverage (10 ranges)

★

NET PRICE

$32.95

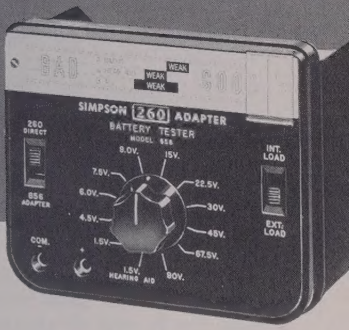
★

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street • Chicago 44, Illinois

Add-A-Tester Adapter

Model 656 Battery Tester



Designed for

TRANSISTOR RADIO SERVICING

AC/DC RADIO SERVICING

HEARING AID SERVICING

★

NET PRICE

$19.95

★

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street • Chicago 44, Illinois

Add-A-Tester Adapter

Model 655

Microvolt Attenuator

Designed for

AUDIO CIRCUITRY DESIGN and
SERVICING, DC CIRCUITRY, and
INDUSTRIAL SERVICING and DESIGN

★

NET PRICE

$18.95

★

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street • Chicago 44, Illinois

WARRANTY

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

Quality is the indispensable component
of every Simpson instrument . . . . . .